Prince.
Palatoplasty.

AN ASEPTIC ATMOSPHERE.

CLUB FOOT.

A RECTAL OBTURATOR.

PALATOPLASTY.

By DAVID PRINCE, M. D.,

JACKSONVILLE, ILL.

JOURNAL PRESS.
1888.

An Attempt to Secure a Sterilized Air

FOR SURROUNDING THE WOUND AND ENTERING THE PERITONEAL CAVITY IN

LAPAROTOMY,

By DAVID PRINCE, M. D.,

JACKSONVILLE, ILL.

The extent of the absorbing surface of the peritoneum, makes it undesirable to subject it to those antiseptic irrigations which are found to be so beneficial in other wounds. It is supposed that a wound made in the amputation of a limb, may be protected from the injurious contact of atmospheric dust by irrigation, and that the spray of carbolic acid diminishes the tendency of germs to develop in the exudates. The skin and the mucous membranes constitute a barrier to the entrance of floating material acting as a poison when it gains access to the living solids and fluids. Some of these atmospheric agents are capable of entering by the lungs, without a previous breach of surface, and the presence or absence of these agents in the air (like the contagium of malarial fever), constitute an important element in the question of the healthfulness of a dwelling place. Other agents, like the contagium of erysipelas, may localize themselves in a habitation, so that the danger of infection continues a long time after the apparent cause has been removed.

Until within a few years, and before the observations with which the name of Joseph Lister is indissolubly associated, the infection inhering in the atmosphere of hospitals was a mystery. It eluded observation and investigation. It defied every attempt at removal by cleansing and the replacing of wall paper and plastering; in short, everything except the complete destruction of the building itself. The difficulty in keeping hospitals free from infection, led many to the conviction that they should always be built with reference to their being torn down after a temporary use. We now know that the prevention of such inhering infection in a building, is the avoidance of the first case of disease, or such management of it by antiseptic agents, as will limit the production of the contagium to the smallest possible quantity, and neutralize that which is unavoidably produced. By antiseptics and ventilation, the problem as to house infection has been pretty well worked out.

The problem attempted to be solved in this paper, is to secure in an apartment for any convenient length of time, an atmosphere more pure than the out-door air, so that a room, or any number of them, may continue, as long as the machinery is in operation, to contain an atmosphere as pure as that of a mountain top.

With the working out of this problem, it becomes practicable to open the abdomen or other parts, and to keep it open an hour or more, and on closing it, to have it in such condition as to material floating on the air, as it would be in, if all the proceedings had been carried on subcutaneously.

The evidence is complete, that erysipelas and some other septic infections, are capable of being propagated by the products of a previous disease of the same kind.

From the Transactions of the 9th International Medical Congress, Washington, Sept., 1887.

The experimental evidence by inoculation may be illustrated by a quotation.

In the "Monograph on Micro-organism and Disease," by Dr. E. Klein, p. 48 (McMillan & Co., 1884), Orth is quoted as having cultivated artificially the micrococci of erysipelas, and afterward reproduced the disease in rabbits by inoculation. Fehleisen found the micrococci only in the lymphatics of the affected parts, and those he cultivated artificially for fourteen generations (which it took two months to do) on peptonized meat extract, gelatine, and solid serum. The micrococci form a whitish film on the top of the nourishing material, and when inoculated into the ears of rabbits, a characteristic erysipelatous rash makes its appearance after from thirty-six to forty-eight hours, and spreads to the roots of the ears and further on to the head and neck. The animals do not, however, die from it. In the human subject, he produced typical erysipelas after inoculation with the pure cultured micrococcus in from fifteen to sixty hours. These inoculations were made for the purpose of curing certain tumors, one of lupus, one of cancer, and one of sarcoma. Fehleisen also in several instances carried out a second inoculation successfully, within a few months. He found that a three per cent. solution of carbolic acid and a one per cent. solution of mercuric bichloride destroyed the vitality of these micrococci.

That the material is also capable of being transmitted through the air, and of fixing itself upon wounds or abraded places, is proved by the strongest possible circumstantial evidence. This being admitted, the problem of prevention resolves itself into that of *exclusion* of the matter from contact with the susceptible part, or destroying it between the moment of contact and the time of its development into disease.

The spray of carbolic acid as devised by Lister, acts probably not by destroying the septic microbes, nor by excluding them, but by rendering the conditions unfavorable for their development. The spray prevents the drying of the exposed wound surfaces; prevents the incipient changes which precede apparent decomposition, at the same time that the germs themselves are deprived of the surroundings most favorable for their development. In the meantime, the germs are destroyed by the white blood corpuscles before they have developed the conditions of attack. The drip or douche of carbolic acid, or of mercuric bichloride, acts in the same way to wash away or to neutralize the activity of such germs as may fall upon an exposed surface.

While this may be said of ordinary septic germs, it is not so certain that pathogenic germs, like those of erysipelas, can be neutralized by the action of a spray or a douche, if they are once implanted upon the surface of the living tissue.

These methods are liable to failure in cases of wounds of irregular surfaces, on which it is difficult or impossible to secure an adequate application to the whole surface, of sufficient intensity and duration to destroy the invading virus. The exposure having been made, however, the chemical or the germicide agent is the only thing that can be relied upon to prevent the natural consequences. The perpetual drip of a weak solution of carbolic acid (one per cent. solution) has been proved to be capable of preventing the development of erysipelas, and of putrefactive changes detrimental to the healthy healing of wounds.

The perpetual bath, antiseptically medicated, is applicable to the feet and the fore-arms, and by lying in the water, it is applicable to the whole body, except the upper part of the neck and the head. Some very satisfactory results have been obtained by this method of management.

It must be admitted, however, that many wounds do not admit of the prolonged application of this or of any other agent capable of neutralizing an infection whose natural development is that of erysipelas or of putrefaction. Among these are wounds of joints and of the peritoneal and the pleural cavities and the cavity in the eye containing the acqueous humor. The agents of infection once introduced, the practitioner is at great disadvantage in the treatment of the case.

Much may be done by drainage and the introduction of disinfecting liquids, but it is necessary that they shall be of feeble force, in order not to irritate the delicate surfaces or not to poison the general system by absorption through the surfaces to which they are applied. It follows from these considerations, that the prevention by disinfecting agents should be the least favored method, and to be employed where the prevention by exclusion is impossible or has been neglected.

The *exclusion* is of two kinds: the immediate and temporary; and the permanent. 1st. The exclusion of those agents from the air which surrounds the patient at the time of an operation, by means capable of purifying the whole atmosphere of an apartment, or the portion of it which surrounds the wound in the progress of formation; and 2d. The permanent exclusion of an infected atmosphere by the mode of dressing.

This implies, that while the atmosphere of a whole room may be made aseptic during the time in which an operation may be performed, it may be too troublesome or too expensive to secure a perpetual purification of the apartment occupied by the patient during his recovery. It is implied, that the exposed wound surface may be effectually secluded from contamination by such a character of the dressings as to make it certain that the infection will be arrested or destroyed.

We have our subject classified by the nature of things; as

1. Antiseptic applications during the progress of cure.
2. The arrest of the access of infection during the progress of cure by the character of the dressing first applied and allowed to remain.
3. The purification temporarily of the air of an apartment in which a surgical operation may be performed.

1st. The plan of the first method is that of a perpetual irrigation, or a perpetual bath.

2d. The second plan is that of a dressing impervious to the floating objects in the air, and it includes the "Lister dressing."

It is found that it is of no advantage to have the dressing air-tight or water-tight, but that a material with fine meshes, like that of cotton, will answer the purpose. If the wound is exposed under a spray or douche, and aseptic cotton, wool, or other similar material, be applied and retained, the agents of septic changes cannot enter as long as the material of the dressing is entirely dry. It is, therefore, convenient to have the cotton or other substance previously treated with a solution of mercuric bichloride or other antiseptic, the water being dried out before the use of the material for dressing. Otherwise the dressing, infiltrated with the exudations from the wound, becomes putrid, requiring its removal sooner than is necessary with a dressing capable of preserving from putrefaction any fluids that may get into it.

In applications of gypsum it is convenient to wet it with a solution of Hg. Cl 2.

3d. The plan of the third class, is that of securing the freedom of a whole apartment from floating minute particulate material of all kinds during the time necessary for the performance of a surgical operation, or the exclusion of air dust from the portion of air surrounding a wound and entering into it.

It is exceedingly probable, that if the cavity of the peritoneum or any other closed cavity, can be opened in an atmosphere free from floating material, and closed again after a short period, the conditions will be the same as though the work of removing a tumor, or other operation, had been done subcutaneously, so as to exclude the contact of air.

The continued purity of animal and vegetable liquids sterilized and placed in vessels closed by sterilized cotton, admitting free access of gases but sifting out particulate material, affords the strongest probability to the assumption that the septic changes occurring in wounds and in closed cavities into which air has entered, would not occur, if the air were free from such material as might be filtered out by passing through cotton or other

material having fine meshes. Reasoning from the general facts here referred to, in relation to animal and vegetable fluids secluded from the floating material of the air, it becomes in the highest degree probable that the material of wounds would be equally exempt from change, if exempt from the contact of this floating material, and that if thus secluded, putrefactive changes would not occur. Wounds and injuries which are subcutaneous, show an exemption from septic changes, though a great amount of vascular and nervous disturbance may arise from the injury.

The use of douches and irrigations, is not for the purpose of purifying the air, but for washing away these minute particles, or rendering them inert by some influence upon them, thus rendering them less able to germinate, or, for the purpose of affecting the living surfaces, increasing their capability of resistance.

I visited several cities of Europe in the summer of 1884, and had it in mind to observe what provisions were made toward the end of exemption from septic changes incident to surgical operations. I saw several new rooms with non-absorbable floors, walls and ceilings, yet having doors opening into the halls of hospitals. There were provisions for non-absorption of anything floating in the air of the apartment, but no provision for purifying the air.

At Hamburg, in connection with the female department of the general hospital, was a room just completed, having four outside walls, so that it was necessary to go through six feet of open air, to get from the hospital into it. There was evidence of great pains to secure the greatest possible degree of cleanliness, but there was no provision for a better air than the outside atmosphere of a large city. I came home resolved to do something better than the latest improvement in Hamburg.

The apparatus to be described is the result of my reflections upon the subject, and experience has suggested so many modifications that new cuts have been necessary in order to illustrate the history of the development of the idea, and the adaptations for hot and for cold weather.

For hot weather, the current of air cannot be secured by heat produced in the operating room above, or in the room below, but must be obtained by a draft connected with a chimney operating as a *vis a fronte* (which is practicable in any hospital having a chimney which is in use in summer), or by a fan, operating as a *vis a tergo*, blowing air into the basement, which is to travel upward through the operating room.

Taking a hint from the observations recently made in Paris upon the effect of rainy weather upon the number of microbes floating in the atmosphere, it occurred to ask, whether or not it is practicable to subject the air entering an operating room to the influence of artificial showers in order to precipitate to the ground, the whole or greater part of these enemies to surgery.

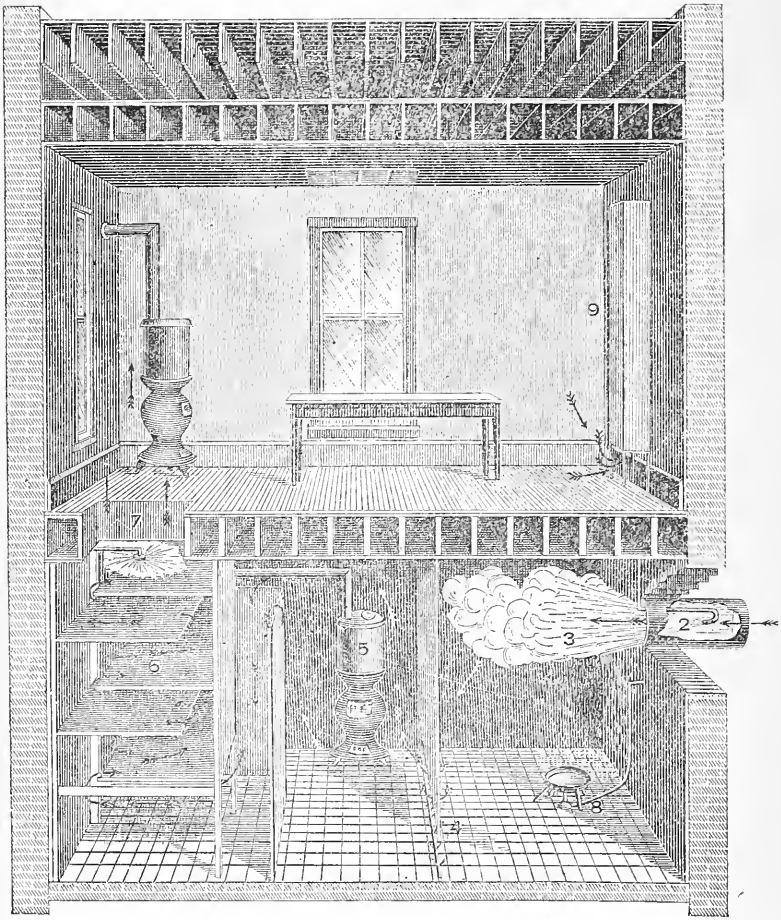
They are known to be heavier than the air, because they entirely disappear from the air within a tight box which has been several months in one position. This principle of rest is of no use to us, for the purification of the air of an operating room by this means is impracticable. The commotion of the air incident to the use of a room, must dislodge the minute particles from the floors and walls, and set them floating again in the air, besides permitting the entrance of common air from without.

The dry filtration by means of cotton or other substances to entangle and arrest the particulate material floating in the air, was not thought practicable, on account of the rapidity necessary in the entrance and exit of the air in order to displace the agents entering from without during the progress of an operation, and also those emanating from the occupants of the room. If, however, we can cause the air entering the room to pass through several showers of water, we have an expedient which may entangle these objects and carry them to the ground.

This paper contains five illustrations of the progress of thought in this direction.

The following cut illustrates the first development of the idea.

Fig. 1.



1. Basement.

On the right hand is an entrance ventilator 20 inches in diameter, in which is a steam jet for the purpose of infiltrating the entering air with very fine globules of water. (2) (3).

The air thus moistened passes in the direction of the arrows under a screen which descends near to the floor (4). It is then warmed by a stove (5).

The air then passes up and down over the top of another screen and up through a series of dripping shelves (6) and through a spray (7) into the operating room above.

The exit ventilation is from the floor through the shaft (9) communicating with an opening in the roof. Under the entering flow of air (3) is pot (8) for burning sulphur, which is supposed to combine with the condensed steam and form a disinfecting solution in exceedingly fine particles.

It has been found that the smell of a moderate flame of sulphur may be thus entirely suppressed so as not to be perceived in the room above.

This cut (Fig. 1) was first published in the St. Louis Medical and Surgical Journal for February, 1885; afterward in the American practitioner and News, in the Transactions of the American Surgical Association, and in the Quarterly Compend. of Medical Science. Fig. 2 shows some modification in the detail of the same plan.

[Continued on page 9.]

Fig. 2.

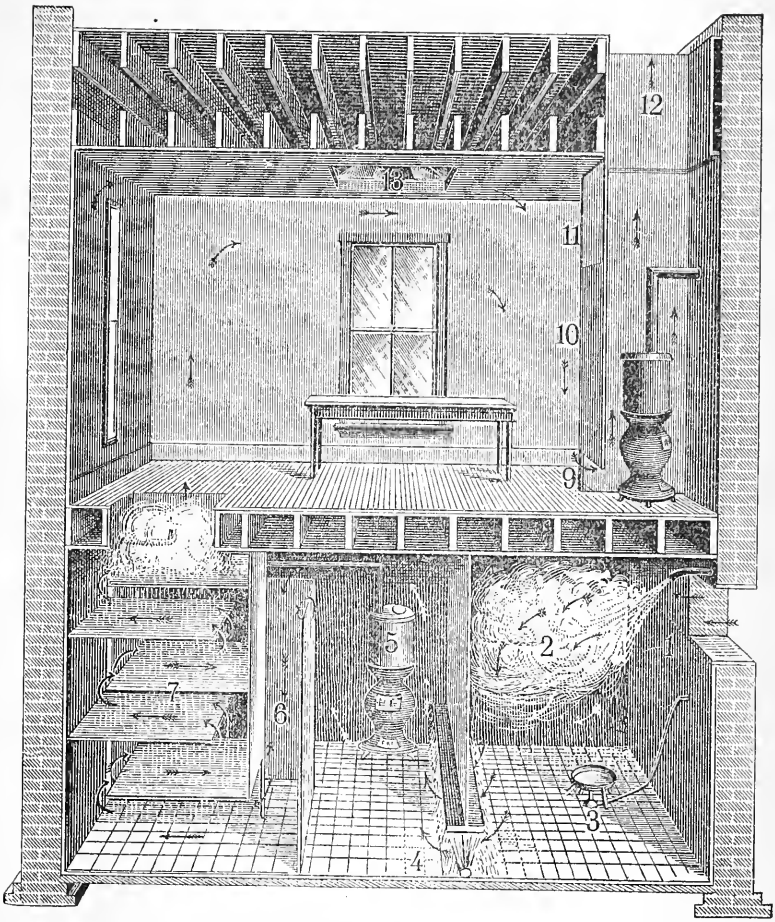
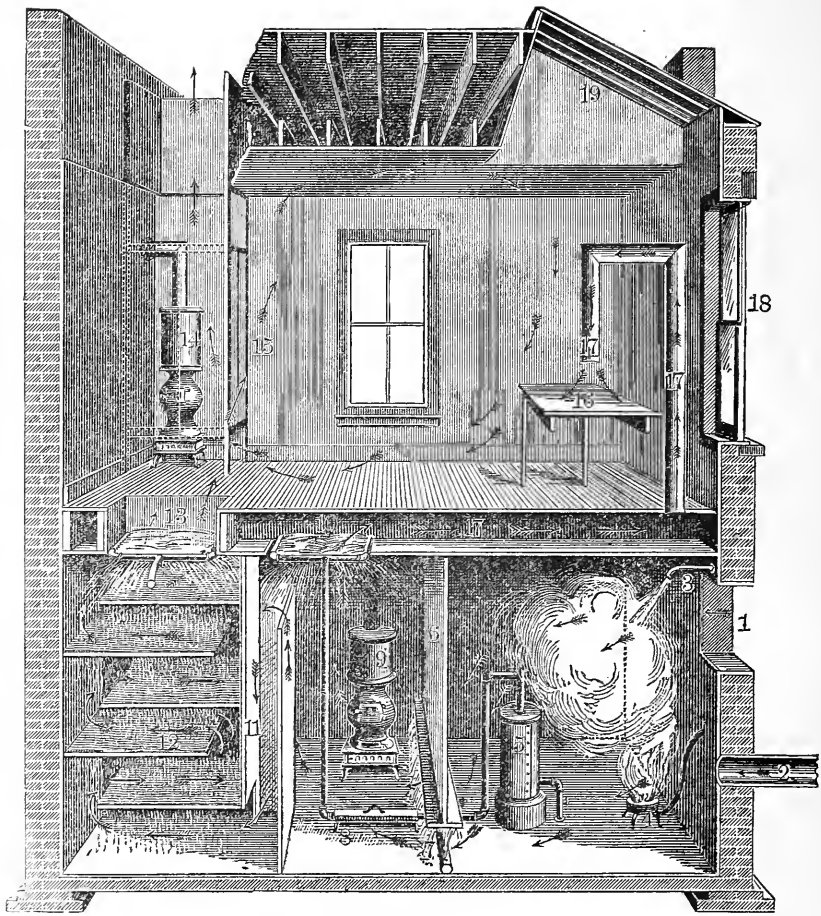


Fig. 1. Window admitting outside air.
Fig. 2. Steam for moistening all floating particles.
Fig. 3. Sulphur pot, with Bunsen burner under it, for slow combustion. A more rapid combustion is secured by mixing alcohol with the sulphur.
Fig. 4. Spray of water through which the air must pass in going to the next apartment.
Fig. 5. Stove for heating the air which has been once washed.
Fig. 6. Screen for forcing the air to pass from near the ceiling through the next washer.
Fig. 7. Shelves of thin muslin through which water drips from the spray in the opening in the floor above.
Fig. 9. Entrance of the air of the room into the draught heated to hasten the rapidity of the escape.
Fig. 10. Stationary partition.
Fig. 11. Movable portion hinged above, and taking a horizontal position under 12, to close the exit through the roof, when the room is used without running the ventillating system.
Fig. 13. Sky-light.

The third figure illustrates the advancement of the idea toward the cotton stage.

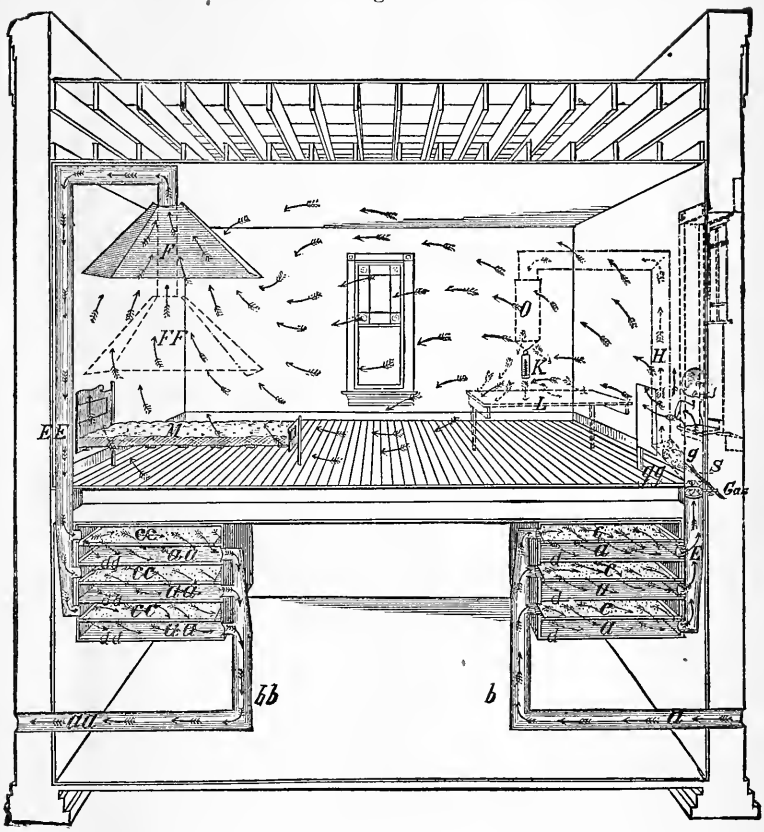
Fig. 3.



Scale, One to Sixty.

1. Entrance of outside air closed when the pipe (figure 2) is in use.
2. Entrance of air blown in by a fan run by an engine for hot weather. Specific gravity is relied upon in cold weather to secure atmospheric motion and change.
3. Steam Jet.
4. Sulphur Flames.
5. Reservoir for Solution of Corrosive Sublimate.
6. Screen or Partition open fifteen inches next the floor.
7. Spray of water through which the steamed air must pass.
8. Box for flame for heating water as it runs through the pipe.
9. Stove.
10. Spray of Sublimate water for the second washing of the air which passes through 18, 17.
11. Screen, the arrows showing the course of the air.
12. Series of muslin shelves.
13. Spray, producing the shower for the second washing of the air going to the room above.
14. Stove for increasing exit draft.
15. Screen separating the space around the stove from the general air of the room, obliging the escaping air to go from the floor.
16. Table.
17, 17. Pipe for conveying sterilized air to the region of a surgical operation.
18. Window.
19. Skylight. The arrows everywhere show the course of the air.

Fig. 4.



a, Inlet pipe.
aa, Outlet pipe.
b, Ascending inlet pipe,
bb, Descending outlet pipe.
E, Ascending inlet pipe.
H, Ascending surgical pipe.
O, Descending surgical pipe, to be raised or lowered.
K, Thermometer.
Under *g* and over *gg* is the oblique *surgical* branch of the inlet pipe.
Gas, Gas flame for regulating the temperature of the air escaping from *O*.
S, Steam jet for regulating the moisture of the same air.
g, At the top of the straight pipe *g* is an eye looking at the flame below. Above *g* is the curved end of the inlet pipe for the *sanitary* use of purified air.
gg, Over *gg* is a screen to interrupt the straight horizontal blow of the same air.
EE, Descending outlet pipe.
F, Canopy.
FF, Canopy let down.
L, *Surgical* table *in section*.
M, *Sanitary* bed *in section*.
The important objects are in section.

c, *c*, *c*, 3 cotton filters for inlet.
cc, *cc*, *cc*, 3 cotton filters for exit.
da, *da*, *da*, 3 floors under the inlet filters.
dd, *aa*, *dd*, *aa*, *dd*, *aa*, 3 floors under the outlet filters.

The next advance in the conception of the subject, was a combination, a purification of the general air of the operating room, and another supply of purified air to envelop a wound in the progress of its formation.

In the device for an additional and separate supply of air for the wound itself, a difficulty arose in the conception of the means of getting it there in such force as to effectually displace the other air of the room, and monopolize the space about the wound. It seemed that for hot weather the force of a fan must be necessary.

The dry filtration by means of cotton or other substances to entangle and arrest the particulate material floating in the atmosphere was not in this stage of the idea thought to be practicable on account of the rapidity necessary in the entrance and exit of air in sufficient amount.

It is intended in figure 4 to illustrate the application of the principle to sanitary as well as to surgical purposes. For sanitary ends the scheme illustrates the protection of a person from the evil agents in general, outside of a room. For instance, in a ship passing through a harbor in a locality infected with yellow fever on the one hand, and on the other hand the protection of persons outside from the infection of a yellow fever patient brought into a previously uninfected district.

On ship board, the ventilation is supposed to be secured by a fan run by the steam apparatus; on land some power most convenient.

The plan of filtration through cotton is illustrated in Fig. 4, for surgical and sanitary purposes, and in Fig. 5, for surgical purposes alone.

The room in which this scheme has been worked out for *surgical* purposes, has a capacity of 3,360 cubic feet.

The air is taken from outside the building and carried through nine hundred and sixty square inches of cotton an inch thick by means of a fan or blower which theoretically should change the whole air of the room once in five minutes. Any object exposed under the tube is shielded from the contact of the general air of the room.

The blower (No. 00 of the Sturtevant manufacture) revolves 3,512 times in a minute. This is a rate of speed which makes very little noise and is sufficient for the purpose. At this rate of speed, it is estimated by the manufacturer, to carry 662 cubic feet of air in one minute. This rate of air supply would completely change the air of the room in five minutes.

There are, however, three elements of loss, viz: the slipping of the band, the escape by leakage through a long pipe, and the resisting influence of friction by which the fans of the blower slip on the air which they propel. It may be assumed that this loss amounts to one-half. The air of the room would then be completely changed once in ten minutes.

The fifth figure illustrates the application of the principle to surgical purposes alone, and has been executed especially for use in this presentation of the subject.

A sufficient number of observations have been made upon substances capable of decomposition, to show a great superiority in the freedom of this cotton filtered air over the air of the same room and over the air of out doors and also of that in other parts of the house. It is certain, therefore, that the endeavor has been successful, to the extent of securing for surgical purposes, an atmosphere far superior to that of the open out door air. By this apparatus, it is practicable to make a laparotomy in an amphitheater filled with spectators, any number of whom may have just come from dissecting rooms and wards having erysipelatous patients, while the air enveloping the wound in progress of being made, shall be as pure as that of a snow covered mountain.

An observation commencing June 22, 1887, by Dr. Grant Cullimore, in which nine tubes containing sterilized peptonized beef broth were exposed (1) under the blower, supplying air which had passed through the cotton filter, seventeen minutes.

On the same day and under the same circumstances, nine tubes were exposed seventeen minutes in each of three other rooms numbered (2), (3), (4). No. 2 (cottage) is in a detached building of two rooms, unoccupied for several

O
K
L
H
g
S
Gas
E
d
d
d
d
C
C
C
C
b
C

months. No. 3 (upper floor) has been unoccupied several weeks, but some months before had in it, erysipelas, gangrene and diphtheria. Room No. 4 is a dissecting room one month after its use; the air being still from the closeure of door and window. The tubes, after exposure and sealing with cotton, were kept in an incubator with a uniform temperature of 100° F.

Other observations employing liquids and also potato slices, have shown a great superiority of the purity of the air thus filtered, over that of the open air and that of rooms whether empty or occupied.

The observation of Dr. Grant Cullimore is sufficient to publish in detail as an illustration:

23d. (1) The tubes exposed to cotton filtered air all remained clear.

24th. Same condition.

25th, 26th, 27th. No observation.

28th. Each of the nine tubes held up by the side of No. 9 of series (4) shows a cleanness in great contrast. This tube of the fourth series was slightly turbid and under the microscope showed the bacillis subtilis.

(2) This room (cottage) has been unoccupied several months, but the windows have been left open.

23d. (2) Two tubes (Nos. 3 and 8) are turbid, showing long bacilli with spore formation.

24th. Same condition.

25th, 26th, 27th. No examination.

28th. Tube No. 2 shows a small deposit at the bottom, clear in the middle portion. At the top a film hangs together and is not easily separated—of a dirty brown color on top and white below. Among other microbes is that of the yeast plant. Tubes numbered 1, 4 and 9 remain clear.

June 22d. (3) Nine tubes exposed seventeen minutes in room (3), upper floor.

23d. Four tubes, 1, 2, 3 and 5, are turbid. Two with vibratile bacilli of medium length; one shows rods without motion, and one a film which shows microscopic bodies like crystals of cerium oxalate.

24th. Same condition.

25th, 26th, 27th. No observation.

28th. Tubes Nos. 1, 4, 6, 7 and 9 clear. Tube No. 2 shows mycelium, bacilli and spores.

(4) Dissecting room.

June 22d. Nine tubes were exposed seventeen minutes.

23d. Two tubes, Nos. 6 and 8, have a thin pellicle at the top, easily broken up. The microscopic appearance is like that of mycelium. Tube No. 5 showed bacillis subtilis; 8 and 9 turbid.

24th. Same condition.

28th. Tubes Nos. 1, 2, 3, 4 and 7 remain clear. Tube No. 9 showed slight turbidity from commencing development of micrococcus and was used for comparison with the tubes of the first series expesed to sterilized air.

The good behavior of the air of this dissecting room is accounted for by its stillness and the opportunity for its dust to settle.

FIG. 5.

a, b. Entering pipe seven inches in diameter.
c, c, c. Three cotton filters forty inches square, the cotton being an inch thick, over which the air enters as indicated by the arrows. There is another set of filters in another box, making 9,600 square inches of cotton through which the air passes.
d a, d a, d a. Spaces from which the filtered air escapes.
E. Exit pipe collecting the filtered air from under the filters.
Gas. Gas jets for warming the air.
S. Steam spray for moisture.
g. Straight pipe for observation.
gg. Oblique portion.
H. Vertical portion.
O. A sliding portion to regulate the height of the exit.
K. Thermometer.
L. Operating table.

The question of microbic influence upon the results of wounds of closed cavities, is further illustrated by a statement made before the French Surgical Congress meeting in Paris, in April, 1885, (*Revue de Chirurgie*, March, 1885, page 359,) by M. Abadie of Paris. In the course of extended remarks upon this subject, are the following paragraphs:

"A factor of the greatest importance is the microbic element. I can easily demonstrate this by taking the experience of ophthalmic surgeons, when, after an operation for cataract, there appears suppuration in the eye. This complication should not be attributed to some influence of diathesis, but to some infecting cause. The essential condition is local and external.

"Previously to antiseptic practices, it was remarked, that suppuration did not occur after iridectomy, though a frequent accident after cataract extraction. The reason is, that after the operation for cataract, the aqueous humor is modified so as to contain more albuminoid material, becoming a better medium for culture, and of the multiplication of the micro-organisms of suppuration.

"At this time, I think that sufficient care is taken of one's person, of those of assistants, and of instruments, but the atmospheric medium of the operation is neglected. The best protective dressings are applied too late, if the inoculation has already been made.

"The air in which we live is surcharged with microbes in innumerable quantities, which hasten putrefaction and interfere with the regular development of cicatrization."

This is an extravagant estimate of the exclusive evil influence of the air dust entering the eye, because we know that eyes are lost from injuries in which the external membranes are not ruptured and from diseases which arise spontaneously. An operation made, however aseptically, upon an eye about to go into destructive degeneration, must terminate disastrously.

There is no doubt, however, that most of the eyes that are lost after operations, might have been saved by the avoidance of the entrance of floating atmospheric particulate material.

The following statistics are interesting in this connection:

Dr. Arthur E. Prince has made cataract extractions on thirty-five eyes in this room since its opening in November, 1884, without a case of corneal ulceration among them. In each case an ointment of iodoform, two parts in a hundred of vaseline, was introduced into the conjunctional duplicatures before the application of the bandage.

Of a series of sixteen cases performed successively in the patients' homes, or in other rooms in this private hospital, the first and the last eyes were lost through corneal destruction. In the last patient belonging to this list, a lady 85 years old, one eye did well and the other went into destructive inflammation, resulting in pain, high temperature and delirium, terminating in death. The two lists added make fifty-one, of which forty-nine in succession were successful.

The elimination from the estimate of dangers in laparotomy, of that of septic contamination, has been accomplished by the employment of this apparatus to such an extent, as nearly to place it outside of the estimated factors of danger in a contemplated case.

The necessity remains for attention to the fingers, the instruments, the sponges or napkins, to drainage and the mode of dressing, but it is not in the plan of this presentation to go into these questions.

It is not assumed that the technology of laparotomy is finished, by having a sterilized air for the envelopment of a wound in the progress of formation. The danger of shock, hemorrhage, obstruction of the bowels from inflam matory adhesions, and from the subsequent entrance of putrefactive and other infections, remains the same as before.

There is a question not often taken into consideration; that is, the extent to which a wound may be poisoned by the dust of a surgeon's hair and the breath of himself and his assistants.

In the position of one's head over a wound, it may be an easy fortuity for

dust and sweat to fall in, and the dust from hair and head may be wafted laterally by currents of air until they fall into the wound under treatment.

The breath of surgeons and assistants unavoidably enters a wound under ordinary circumstances. It mingles with other air and enters an open peri toneal cavity. In a perfect state of health it may be better than other surrounding air, in consequence of leaving some of the floating particles along the moist air passages. In case, however, of diseased surfaces, from mouth and nose to lungs, it is easily conceived that particulate material from these surfaces, including the germs of suppuration and septic development, may be the true cause of complications not otherwise explained.

Some observations upon the particulate contents of the expired air have been made by Shablovsky and Vargunin of St. Petersburg, Russia. Some account of these appeared in the Philadelphia Medical News for November 24, 1887, from the Medical Chronicle for November, 1887.

According to these observations, the average number of microbes in the expired air (those of the surrounding air being taken at 100 per cent.) amounts to 54.18 per cent. According to this, 45.72 per cent. are lost in the air passages; and if these passages are healthy, the expired air ought to be purer than the surrounding air.

The first half of the expired air has twice as many microbes as the last half, showing that the air that has remained longest in the lungs has lost the most. The microbes found in the expired air were found to be mould fungus, yeast fungus and the bacillus subtilis, with a large number not differentiated and named. The danger therefore is not in the microbes that have been returned to the surrounding air, but in those that have originated from diseased surfaces. The apparatus here described prevents the possibility of infection from these causes, by blowing away all air not in its own current, and monopolizing the field by its own cotton filtered air. It is a satisfaction to know what kind of air enters a wound, and in searching for causes of suppuration and septiccomplications; to be able to eliminate the atmospheric element.

Fingers and instruments, with the possible approach through the blood of the patient, remain for consideration. The razor for the hair of the hands and arms; soap and nail scrapers, must receive proper attention at the same time that the therapeutic fortification of the patient against suppurative diseases is attended to. The surgeon treats his patient internally with iron, quinine and laxatives, and treats his hands and his instruments externally, trusting that the dust he raises will be blown away and replaced by the pure air of the blower. The endeavor is to make all wounds behave as well as the best; to aid the forces of Nature by lessening the number of her enemies, thus securing a sense of safety in the management of the class of wounds in which septic complications lead to death.

Drainage is a good or an evil, according to its management, whether or not it lets out more enemies than it lets in. A mere drainage is not thorough enough. Septic microbes will travel up the sluggish stream of a drainage tube. The tube must be flushed often enough to remove or destroy the germs which enter from the air. Theoretically, a cotton plug ought to be a sufficient protection, but the management is not likely to be perfect.

A flushing once in three hours, with a sublimate solution, (one to ten thousand,) with a cotton plug in the drainage tube during the intermediate time, constitutes the best protection. The sooner, after the exudation or effusion of fluids from serous or wound surfaces, it is removed, the greater the chances will be for organization of the solid remains: the completion of repairs.

Immediately after a laparotomy, the fluids seek the lowest places according to gravity, but if these lowest places are occupied with fluid, the surfaces of higher places will become the seats of fluid accumulations, and these higher accumulations may be cut off from their descent by adhesions. Then, when the lower accumulations are drawn off, the higher ones remain as abscesses or the centers of putrefactive disseminations.

The word drainage is therefere misleading. The idea of *draining* should be supplemented by the idea of *flushing*.

A weak solution of boric acid or of boroglyceride may be considered safe as an immediate flushing in relation to constitutional injury from absorbtion over large extents of peritoneal membrane.

The good behavior of wounds included in laparotomy, is usually assured in three days, while slow septic complications often manifest themselves at later periods, the infection being slow at first, but afterwards rapid. This direction of thought leads to the plan of *preventive drainage* combined with *protective flushage.*

CLUB FOOT.

[Reprinted from the St. Louis Medical and Surgical Journal for May, 1888.]

It will be borne in mind, that in most cases there is a doubling of the foot at the waist, or at the joining of the calcaneum with the cuboid bone on the outside of the foot, and of the astragulus with the scaphoid, and through this medium with the cuneiform bones on the upper and inside. This arching of the instep becomes firm by means of shortening of the ligaments on the plantar surface, by which these bones are held together.

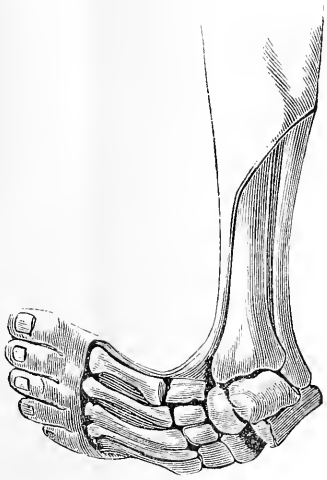


Fig. 1. From Little,

(Fig. 1 illustrates this condition.) They are entirely beyond the reach of any cutting instrument, unless an open dissection is made, and they are too strong to be torn by any sudden force which can be applied by the hand.

The indication is to apply force to the plantar surface of the metatarsal bones. The tibia is the fulcrum of this lever and the shortened tendo-achillis is the resistance.

As one of the objects to be accomplished is the straightening of the crooked lever (the foot being the lever) it is important that there should be a pretty firm resistance at the heel. Any diminution of the force with which the tendo-Achillis resists the pressure upon the metatarsus, by so far diminishes the only means by which the surgeon accomplishes the straightening of the foot. The division of the tendo Achillis is therefore worse than useless, unless there is an absence of the usual curvature at the waist of the foot. The high instep which is often seen after the treatment of Talipes-equinius by division of this tendon, is thus accounted for. Hereafter, with the general abandonment of this treatment by tenotomy, a more natural shape of the instep will be secured by the time the heel is brought down. We are now ready to appreciate the principle which should control the construction of apparatus. It is simply that of a lever.

Fig. 2 represents one of the forms which the lever may be made to assume in the treatment of Talipes equinus. While the appa-

ratus is attached to the sole of a shoe so as to bring the pressure under the metatarsal bones, a strap passes over the waist of the foot which throws the upper end of the apparatus forward of the leg. This upper end is thus drawn back by means of a strap passing behind the leg.

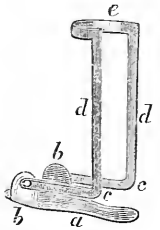


Fig. 2.

Fig. 2. A very powerful traction upon the tendo Achillis is thus obtained without interfering with the locomotion of the patient. Indeed, the motion incident to walking is an advantage, as the ligaments and tendons yield more readily to a tension which is constantly varying than to a steady pull. The reason of this is, that a much greater tension can be endured for the moment, followed by partial or complete rest, than where it is continuous.

a. The sole of a shoe. The upper part to be imagined.
bb. A flat, thin plate of iron attached to the sole. The turned up ends of this plate are perforated for a joint.
cc. The angle of a metallic strap, the horizontal part of which is parallel with the sole and the vertical part with the leg.
dd. The vertical portion of the strap. This is a lever with fulcrum at *c*. The resistance at *b*, while the power is applied around the leg.
c. The metallic bow which connects the two parallel levers at the top. A leather strap passes across the instep and has its attachment at *cc*.

The cut (Fig. 2) represents an easy method of meeting the mechanical indication which has just been considered. It is the skeleton only of an apparatus. Neither the leather fastenings nor the enclosed foot are shown. The imagination can see them.

The treatment of talipes varus, without the use of any cutting instrument, is practicable in almost all cases, if undertaken before the period of walking.

The parts are yielding and the metamorphosis of tissue is very rapid. The new growth in the progress of treatment is in the forced direction, in verifaction of the maxim: "As the twig is bent the tree is inclined." It is a question of time, and as soon as the progress is at such a stage that the act of walking comes in the ordinary development of growth, the exercise of the natural function of the organ tends to confirm and complete the restoration.

If one with his hands, takes hold of a foot congenitally deformed, while the foot is yielding, as it is before it becomes stiffened in walking, he can go a great way toward restoring the foot to its natural form. The problem is to adapt appliances to imitate the action of the hand;—something that will not get tired, but will tire out the elastic resistance of the muscles, the tendons and the connective tissue.

No satisfactory shoe has yet been contrived. It is to be remembered that the parts will not endure long continued pressure, and a shoe will press every day on the same place.

A person confined to the same position while undergoing treatment for fracture of a bone without careful attention to the necessary changes of places of greatest pressure upon the surface, gets a bed sore.

The deformed foot confined in a shoe which is made to press every

day upon the same part, with sufficient force to alter its shape, is under the same necessity for a change in the places of the greatest pressure; otherwise there comes a sore corresponding with a bed sore.

The pressure can be intermitted by the temporary removal of the shoe, but on re-applying it, the pressure comes back upon the same surfaces. On the other hand, some extemporized appliance, which is not removed and reapplied as a whole, but in parts, making its greatest pressure in a little different place with each application, gives the parts subjected to the greatest pressure one day, an opportunity to rest the next, on the change of the dressing and the consequent variation of pressure. In talipes varus and equino-varus there are two principal points to be approximated. Some point on the outer, or outer and front of the leg just below the knee, and the other point upon the outer surface of the foot over the metatarsal bone of the little toe. This is ordinarily most easily accomplished by binding to the leg by means of strips of adhesive plaster a piece of tin having two hooks. There should be (Fig. 3) more than one hook, in order to vary the point of application without the removal of the tin. For the application to the foot, the best plan is to bind to the sole of the foot some light shield of leather, gutta percha or tin, in order to distribute the pressure and avoid uncomfortable pressure on a small surface. This shield of tin or other substance should have an eye or ear situated on the outside of the metatarsal bone of the little toe, for the attachment of a cord which is to extend to one of the hooks on the tin shield attached to the leg. In this cord, acting as an extending brace between the distal part of the tarsus end the proximal part of the leg, there should be intercollated some elastic material in order to secure a perpetual moderate extension. (See Fig. 3.) The apparatus illustrated in Fig. 2 is applicable to Talipes equinus or to Talipes varus, after the deformity has been nearly or quite removed. For Talipes equino-varus, constituting the greater portion of the cases of congenital club foot, it is necessary to have some appliance which shall roll the foot at the same time that the heel is brought down. The places of pressure with each removal and replacement of dressing will be a little different, so that parts pressed too much one day, will be pressed a little less the next.

Fig. 3.

The tin under the sole of the foot is seen to be held by strips of plaster.

The tin upon the outer side of the leg is seen to be held in the same way.

The elastic cord approximates the outer part of the foot toward the outer part of the leg, performing the functions of the peroneus longus and the peroneus tertius.

Any apparatus which acts like the hand renders unnecessary the division of any other tendon than that of the heel.

The most yielding parts soon elongate, so that the whole force comes upon the parts more unyielding—chiefly the short ligaments which bind the bones of the tarsus and those of the ankle together. It greatly

hastens the progress of cure to give the little patient ether, and with the hand of the operator to rupture these most resisting ligaments and condensed layers of bundles of connective tissue. Then, in a few days, a point of no progress will again be seem to have been reached, when another etherization should be practiced and another set of resisting parts ruptured by the force of hand. The resisting parts will usually tear with a vibration felt by the hand, with a cracking sound. A very small amount of irritation follows this apparently harsh treatment, if only the foot is kept for a time immovable, by dressings that do not produce tension of any part. This first dressing after this stretching should not be elastic. It should be easy, but immovable, for a day or two, when the elastic tension may again be resorted to, but it should never be to such a degree as to be uncomfortable.

There is hardly any deformity, unless attended by active spastic or irritative contraction, having its origin in the central nervous system, which cannot be changed slowly by the careful application of moderate force during a sufficiently long period.

The progress of the treatment on this plan undertaken after the beginning of the period of walking is ordinarily so slow that it is more satisfactory to take out a triangular portion of the tarsus, unless the circumstances are such that prolonged time and attention are not attended with great inconvenience.

The following four cuts illustrate appliances and results worked out several years ago; gutta percha being the agent employed. It was applied in the warm state and allowed to cool under the pressure of a pair of calipers.

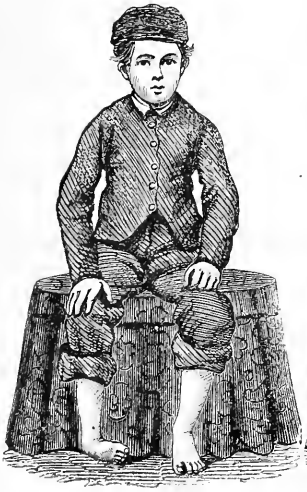


Fig. 4.

Fig. 5.

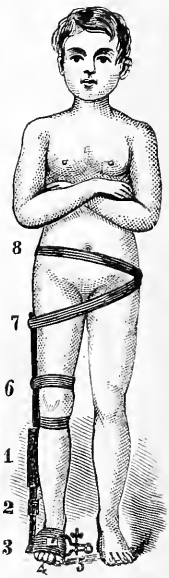


Fig. 6.

Fig. 7.

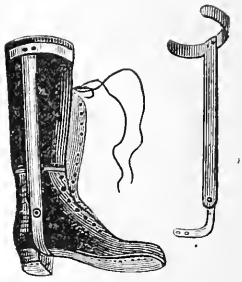


Fig. 8.

Fig. 8 ilustrates a form of brace intended to counteract the moderate tendency of the foot to turn over. It is rather preventive of deformity than curative.

TARSECTOMY.

Among the fruits of modern ideas in relation to the antiseptic treatment of wounds, is that of daring to cut into the cavities of joints without fear of septic troubles.

Progress in the methods of treatment of talipes, in persons beyond the period of infancy, has been retarded by the fear of septic decomposition of the fluids in the complicated joints of the tarsus with septic absorption and consequent poisoning of the general system, endangering the life of the patient.

Ablation of the cuboid bone in the treatment of club foot is supposed to have been first suggested by Little in his work entitled "Deformities of the Human Frame," *p. 305. London, 1853.*

This suggestion was put into practice without a satisfactory result, by S. Solly in 1854.

Mr. Lund, of Manchester, removed the astragalus in the treatment of club foot in 1872. (1.)

Resection of a wedge shaped portion of the tarsus is said to have been first performed by Mr. Davies-Colley in October, 1875, and repeated by Richard Davey in November, 1876. (2.)

In a discussion in the Copenhagen Congress, Ruprecht, of Dresden, denominated the removal of a wedge-shaped portion of the tarsus. Tarsotomie de Poinsot.

In a letter dated January 31, 1888, Mr. Richard Davey reported forty-one cases of operation by himself, according to this method, with forty cases of success and one death from septicæmia. Mr. Davey employs no

(1.) Proceedings Medical Society of London, Vol. IV., 1879.
(2.) *Ibid.*

antiseptics, but relies upon clean water at first, and a dry blood clot afterward.

The little favor which *tarsectomy* had secured at the time of writing the article on orthopedic surgery by Frederick R. Fisher (of the London Victory Hospital for Sick Children) in the 6th volume of Ashurst's Encyclopedia of Surgery, 1886, is shown by the remark that "the number of cases of club foot treated by excision of the tarsus may be numbered by tens, while the cases treated by the ordinary methods may be numbered by thousands."

There is not anywhere on the limbs a more dangerous place for the invasion of putrefactive agents than the joints of the tarsal bones.

The joints of the carpus are equally complicated, but they are not so often a field for those surgical processes which expose them to the air. There is a labyrinth impossible to explore completely with antiseptic means for hunting out septic agents. The most effective searcher is peroxyde of hydrogen, but there are blind pockets, which easily resist the pressure of the oxygen eliminated by the contact of pus. The septic fluids are squeezed into corners, to expand again and renew their destructive war on the living tissues.

The exsection of portions of the tarsus for the relief of deformities of the feet requires, for the most successful results, that the after dressings be exclusively wet or exclusively dry.

The dry dressing is most convenient, requiring no attention for days.

The blood serum becomes squeezed out of the clot; absorbed by the dressings, and the residual clot becomes penetrated by the proliferating vessels until it is entirely replaced by new tissue.

When this process of the invasion of the clots by the blood cells and blood vessels emanating from the adjoining tissues is complete: the danger of infection bycontact with the air is nearly passed.

The contact of the germs of erysipelas, phlegmon, and of gangrene may set up destructive changes, but with moderate washing the pus covering the granulating surfaces will remain *laudable* and cicatrization will go on rapidly.

For the dry dressing to succeed, it is necessary that the implantation of germs at the time of operation be avoided, or that they be sterilized by the washes applied to the wound previously to the application of the dressings. In this relation, the character of the blood clot is of some importance. It is desirable that its solidity be not diminished by the application of water. A squeezed sponge does not impart any water to the surfaces to which it is applied, but it drinks up any fluid that may be there, leaving dryer than before such clot as may remain.

Mr. Richard Davey of the Westminster Hospital, London, was in 1884 a a disbeliever in the ideas now generally accepted with regard to antiseptics. In an operation by him for *talipes varus* upon a 12-year-old boy, witnessed by the writer in 1884, he removed a wedge-shaped portion of the tarsus by a saw working in the groove of a director passed over the bones and under the soft tissues of the top of the foot. The wound was dressed in its own blood without the application of water and a splint applied to prevent motion.

The notion of the excellence of blood as a wound dressing is an old popular tradition, and there is some truth in it, but the exposure to the air of non-putrefaction dressing impervious to floating atmospheric dust must be far superior to the surface of a blood clot with its non-sterilized retaining bandage. The surface of clot thus exposed, invariably becomes putrid in this climate, and in dryness London can have no superiority over us. That a dressing of undiluted blood may be better than non-sterilized dressings may readily be conceived, but in this day it is a queer freak to scoff at antiseptic agents and rely upon such a perishable defense against atmospheric putrefaction as blood. It is true, blood is a natural dressing, but the instinct of the dog leads him to lick it off.

The wet dressing, the lotion being carbolized or sublimated water, is *sure*, but more troublesome. In this plan of management the omission of fresh application of carbolic acid for some hours is disastrous. The agents of decomposition pass readily through the damp dressings to the wound and to its fluid or its solid or semi-solid contents.

The discontinuance of a sublimate wash after beginning on the wet plan, leaving the dressings to become partially dry, is less dangerous.

The mercurial does not go off into the air like carbolic acid, but it may be absorbed, or by dryness become inactive along the surfaces surrounding a wound, permitting the microbes of decomposition to pass in. Constantly wet or constantly dry, should therefore be the maxim.

If, before the dressing is applied, the wound has become infected with germs beyond the power of the exudates to digest and destroy them, the dry method must be a failure. Only the frequent or perpetual drip, or the bath, can insure against suppuration and putrefactive complications.

In the case of long exposure to the air, as in accidental wounds, the wet dressing should be employed so as to secure the perpetual presence of the antiseptic until the time when the exudates upon the surfaces of the wound have become replaced by organized material. After that, the more convenient form of dry dressing may be employed with safety, the purulent product being carefully washed away sufficiently often.

From these considerations, the application of a dressing perpetually wet with an antiseptic lotion must be the safest for wounds exposed a considerable time to the air, and especially to gun shot wounds presenting irregular and ragged surfaces, some of which are likely to be necrosed, though under a careful antiseptic drip or bath they need never present any smell or other sign of gangrene. This is a distinction important to secure. The necrosed tissues following a gunshot injury or a telipes operation, behaves like catgut ligatures. They are absorbed if not too large or too resisting for the digestive powers of the lecucosytes, or they remain for a gradual odorless maceration or final expulsion. If exposed to the action of suppuration and putrefaction germs they mortify and smell.

MANNER OF OPERATING.

For cases in which, on account of age or the degree and resistance of the deformity, it is necessary to remove a portion of the tarsal bones, the following method is recommended:

Richard Davey, of the Westminster hospital, says that he tried chisels but abandoned them for the saw.

The writer tried the saw and abandoned it for chisels.

Only one opening of the skin is necessary, and four instruments are enough—a knife, two chisels and a mallet.

After an antiseptic washing of the skin and the cleaning out of any residual material between the toes and among the folds of the deformed foot, an incision is made along the outer side of the foot.

Figs. 9 and 10 illustrate the form of the foot and the necessary place of the incision. The dotted lines indicate the course of the chisel.

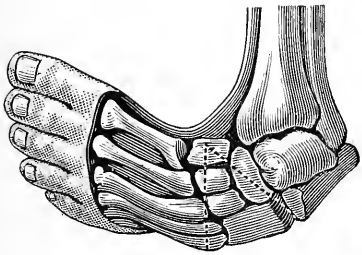


Fig. 9.

Fig. 10.

Fig. 10, left foot. The dark line indicates the incision and the dotted lines, the passage of the chisels through the bones; when the chisels come into, contact each helps the other to pry out the included portion of the tarsus.

In Talipes varus, including nine-tenths of the whole number of foot deformities, the incision is made along the outer edge of the foot from the proximal end of the metatarsal bone of the little toe, to the cuboid bone or, in extreme cases, to the calcaneum, as the intention may be to make a larger or smaller amount of excavation. These two chisels come into contact on the inner or medium side of the foot, and each serves as a lever to lift out the portion of the tarsus included between the two chisels. This is the principle of the proceeding, though in practice, the bones and ligaments may require to be removed in smaller pieces than this description implies. The exact amount of excavation is determined by the extent necessary to restore the correct form of the foot by the hands of the operator at the time.

If the case is one of Talipes varus, there is no advantage in dividing the heel tendon, but if the *equinus* element is strong (Talipes equino-varus), there is great advantage in dividing this tendon, as the first step in the operation. In this case the tendon is put upon the stretch and the bistoury

introduced on the median side. No stitches are taken in the foot because the surfaces are left in the most ragged condition possible: Fags of bone, joint cartilage, ligament and connective tissue become surrounded by blood clot. These loose ends are, most of them, in a condition to slough if left to their own power of maintaining their circulation. Any plan which fails to maintain the vital capability of the blood clot must be a failure. Many of these fragments of tissue lie in the clot to be afterward perpetuated in their vitality by the approach and penetration of the capillaries extending themselves through the clot from the adjacent surfaces, which have been left in such relations as to maintain their full vitality.

(1.) Before the removal of the elastic bandage, which had been applied to the limb above in order to secure a bloodless operation, the dry wound is washed with a warm sublimate solution, 1-1000. Then (2d) sublimated lint is applied over the wound and the foot is brought into the best approximation to the correct form, and retained by adhesive plasters extending from the outer surface of the foot to the upper part of the leg. A sufficient amount of sublimated absorbing material is then applied to drink up the blood and serum subsequently escaping. (3d.) A gypsum plaster is then applied in order that the patient, on waking from his narcosis, may throw his foot about without hurting it. After this is done (4th) the elastic bandage is taken off the leg, permitting the wound to fill with blood and the serum to escape into the surrounding absorbent material.

By this procedure, the blood escapes dilution by water, and its clot is the most solid possible, free from the possibility of septic infection, and best adapted to the preservation of its blood cells and to their subsequent restoration, and also to the penetration from the surrounding living parts, of leucocytes and proliferating blood vessels.

The rule is to leave this dressing untouched for a week or more, till there ordinarily comes some smell. By this time, the blood clot will have become alive again with some power of resistance to the encroachment of enemies. Afterward, elastic extension is kept up until the short ligamentous connections about the ankle joint have adjusted themselves under the influence of this perpetual tension. (See fig. 2 and explanations.) It afterwards becomes necessary to wear a brace for a long time in order to retain what has been attained, whether the treatment has been executed with or without cutting. (See figures 2, 3 and 8).

Nothing is more common than the loss of some of the success of treatment by neglect after the cessation of treatment. To avoid this loss, it is important that the deformity be over corrected before the active treatment is discontinued.

In case of Talipes equinus, or Talipes equino-varus, the improvement under treatment should be carried so far that the natural use of the foot will tend to preserve the advantage that has been gained. It is never safe to dismiss a case as cured until this degree of success has been attained.

The manner of dressing should be further explained: Gypsum is never employed except temporarily after some operation, with or without cutting, in order to shield the part from the pain attendant upon movement or to hold, for brief periods, some position forced upon it under narcosis, by pressure of the hands. In the latter case, a screw clamp or an elastic bandage over and around a splint is resorted to until after the hardening of the gypsum. An elastic tension for changing the form should not be employed until the soreness immediately following an operation, by cutting or by force, has passed by.

To retain form and to prevent pain are the functions of plaster.

To improve form is the function of elastic tension, and it is made elastic in order that some imitation of the natural movements may be permitted, thus securing an active circulation and a rapid change of nutrition through which short ligaments become elongated and those too long become shortened. The discomfort of a perpetual position is relieved by a little movement. If by any imperfection or mistake in management, the wound becomes putrefactive the perpetually wet dressing must be resorted to and kept up until all odor has for a considerable time ceased to be produced.

The detail of this proceeding is very important. The affected foot should be immersed for a considerable time in a warm bath, having 1-1000 Hg. Cl^2.

The wounds and its sinuses should be injected with this solution diluted one-half by peroxyde of hydrogen. Afterward the foot is to be enveloped in a dressing kept perpetually wet with a 1 per cent .solution of carbolic acid.

If the invasion of putrefactive enemies is not promptly repelled by antiseptic measures the result may be disastrous. The wound made in the exsection of the tarsus unavoidable exposes the tendons of the Flex. long policis, flex long digitorum tibialis anticus ext. longus digitorum and peroneous tertius which pass up the leg and afford a ready passage for the fire of septic inflammation. If the life of the patient is saved, yet great loss of time is experienced in the course of the treatment.

INTERNAL INCISION.

"OPEN INCISION AND FIXED EXTENSION."

"In the transactions of the International Medical Congress meeting in Copenhagen in August, 1884, is a contribution by Dr. A. M. Phelps, of Chateaugay, N. Y., advocating the treatment of obstinate Talipes varus by an open incision on the inner side of the foot.

In the Medical News (Philadelphia) for January 21st, 1888, this operation is explained and illustrated by a wood cut by Dr. C. N. Dixon Jones, of Brooklyn, N. Y.

The lines of the incision are seen upon the right foot in Fig. 10.

An incision is made from the internal malleolus to the tuberosity of scaphoid, and from the center of this line, another incision is made vertically downward, dividing everything that resists, until by forcible pressure, the foot can be straightened out.

The artery and the nerve are drawn aside and held by a blunt hook as the dissection goes on. The foot is held in its corrected position by gypsum four weeks before the first dressing is removed.

The dissection of the inner side of the foot is favorably referred to in the "Year Book" for 1887 by Dr. Philippson (Deutsch Zeits., f. Chirurg, XXV. 287, for 1886-7. Dr. Gibney (Trans. Med. Soc. State of N. Y., 1886), p. 368, refers favorably to the Phelps method and states that Dr. Bradford, of Boston, has been working at a machine which he calls a Tarsoclast.

In the progress of treatment, with or without the division of bones and tissues, it is convenient to employ not only the force of the hand, but also the force of a screw in some form of apparatus in which a carpenter's screw clamp constitutes the force which is to change the form of the foot.

Apparatus other than that which can be extemporized at any time has been worked at by Monier, as reported in the "Year Book," 1887, from Gazette des Hopitaux No. 1, January, 1887.

It is doubtful, however, whether a permanent apparatus can be made to do any better than an extemporized carpenter's clamp and two pieces of wood and three roller bandages.

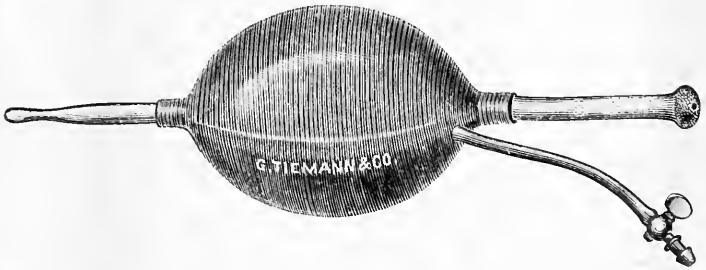
St. Louis Medical and Surgical Journal, February, 1883.

A RECTAL OBTURATOR.

The basis of the following communication was presented to the St. Louis Medical Society, Nov. 18th, 1882, exhibiting a rectal stopper or obdurator.

1. For enabling the alimentary canal to hold two or three gallons of water in cases of obstinate constipation, in cases of obstipation and of strangulation; or, for the speedy and complete washing out of the alimentary canal on any account.

2. For the holding in the alimentary canal of comparatively large amounts of nutritious fluids in cases in which the introduction of food by the mouth is impracticable.



ANAL OR RECTAL OBTURATOR OR STOPPER IN POSITION UPON A WALES' BOUGIE.

3. For the holding in the large intestine of an adequate quantity of alcoholic liquids introduced for anesthesia in surgical operations, or injuries, or for the alleviation of shock or terror from any cause or in all conditions in which alcoholic anesthesia is desirable.

4. For the speedy dilution of the blood through the absorption of water from the intestinal surfaces in order to stimulate the kidneys to filter out any poisonous constituents of the blood, whether these impurities have been introduced by accident or design, or whether they have developed in the blood and in the glands by the chemical process incident to disease.

5. For the reduction of temperature in fever and inflammation by the more ready discharge, through the various emunctories, of irritating material by the thinning of the blood through the introduction of water.

6. For the raising of the peritoneal floors of the pelvis, in order to increase the facility in the removal of adherent ovaries, tubes or tumors, approached from above by laparotomy.

I have taken great interest in the efforts of Dr. Wales, late Surgeon-General of the United States Navy, to construct a bougie by which the large intestine can be well distended in cases of intestinal obstruction;

and in some cases of obstruction I have been unexpectedly successful in securing a movement of the bowels by an introduction of the bougie high up. This is a specimen of Wales' bougie (showing the bougie); but manage it as you may, the water is likely to leak out and the full extent of the desirable result may not be obtained. Reflecting upon this subject, it seemed to me that if there were an obturator fitting inside the sphincter, it would effectually prevent the regurgitation of the water used, so that the large intestine would be completely filled and passing the ilio-coecal valve, filling the small intestine also, I wrote to Mr. Stohlmann, of TIEMANN & Co., telling him what I wanted, and a few days ago I received this. This is to be filled with air or water (referring to the obturator), and is intended to be of such a size as to fill the lower part of the anus and act as a valve, so that the greater the pressure is above, the tighter it will fit. In using this, according to this idea, it should be placed upon the bougie previous to its introduction. The bougie is then worked up as far as convenient and the obturator pushed in through the sphincter, and after being inside the sphincter it should be injected with water or blown up with air. It is probably better to use water because it is not so likely to leak away as air; you then fasten to the tube some kind of syringe and fill the large intestine. The practicability of securing a disentanglement of a strangulated intestine, the obstruction being occasioned by a loop of intestine caught upon a bridge, which may be the result of a previous inflammation, or occasioned by intussusception, in which the upper portion of the intestine is drawn into the lower—the practicability of this has been established by many successes. Where the obstruction is below the ileo-coecal valve, there can be no doubt of the ability, with the obturator, to fill the large intestine below the obstruction and exert an influence to disentangle it. It is not to be supdosed that all the attempts will be successful, for there may be such adhesions as to make it impracticable, as in the case of strangulation, in hernia in the inguinal canal, or under the femoral arch. The expedient might be supposed to fail in cases of strangulation of the small intestine, on account of the tight fitting of the ileo-coecal valve, but the experiments made by Dr. Thomas Battey upon the dead subject, prove that the ileo-coecal valve yields when the pressure becomes more than moderate.

Water passed into the small intestines in three cases out of four experiments by the writer upon the dead subject. In this fourth case the valve was tight, resisting pressure sufficient to burst the colon.

Since the first publication in 1883, the apparatus has been improved by TIEMANN & Co.; and further use has established its value.

Within a few days, (March, 1888,) four days after the removal of an ovarian tumor, there was a failure to secure a movement of the bowels by liberal dosing with elaterium and croton oil. In a brief period after the employment of the obturator and the distension of the large intestine, there came a fecal evacuation. The danger in such a case is, that the natural force of the muscular vermicular contraction of the intestine, forcing gas and liquid down upon the part held by a recent adhesion, may not be sufficient to straighten out the kink which stops the progress of the intestinal contents.

A distension from the filling of the large intestine below, may bring the strictured portion into such a position that the contracting forces may straighten the small intestine and enable the vermicular force to tear the exudate which was causing the arrest.

PALATOPLASTY.

A paper explaining new instrnments and new methods of operating for Cleft of the Palate, was read before the St. Louis Medical Society, November 28, 1874, published in the "St. Louis Medical and Surgical Journal," January, 1875; copied with cuts in the "London Medical Record," March 3, 1875, and revised and published with additions in the "American Practitioner," for March, 1876. A report was also made to the Illinois State Medical Society, in May, 1884, and to the International Medical Congress, meeting in Copenhagen, in August, 1884.

Since the time of the first presentation, the methods have been improved, and a new instrument devised. A new modification of the quilled suture has been introduced, which will be described under the name of the *Bead Suture.*

The employment of the new methods and instruments, is found very much to shorten the duration, while the loss of substance is lessened, and the probability of union by the first intention is increased.

The facility with which the two halves of the cleft palate may be united is not generally understood. There is an equal want of appreciation of the advantage of an early operation, made before the expiration of the imitative period of life. For illustration: the reason why adult persons fail to learn to pronounce accurately, the peculiar sounds of a foreign language, is not in the constitution of the organs of speech, but in the inability to adapt muscular action to new results. The child varies muscular movements until the exact sound is secured, and ever afterward, the muscles move so as to secure the same sound. The difficulty experienced in learning a foreign language, applies more emphatically, in the case of cleft palate. The muscular deficiency may be completely removed, but the lack of muscular education, hinders the acquisition of perfect speech. One of the difficulties in self-education, is in the fact that the person speaking does not know that his pronunciation is wrong. It is often noticed, for example, that a child which has acquired some peculiarity in speaking, does not notice that its pronunciation is peculiar and it is with the greatest difficulty that the habit can be overcome. This difficulty inheres in the habit of false pronunciation.

The same force of habit continues, after an operation for the closure

of a cleft palate. By careful drill, the defects of pronunciation can be overcome, little by little, until the detail of speech becomes nearly or quite perfect. It is probable, that much of the depreciation in which the operation is held, is owing to this want of drill, after an operation which is in itself perfect.

It follows from this, that the work is only half done when the closure of the palate is secured, even in the most perfect manner. Many persons will learn to execute the proper sounds when speaking slowly, and yet, in ordinary rapid conversation, they will speak as badly as before. The only remedy for this habit, is to forbid ordinary conversation, for a time, and to permit speaking only under instruction, every mistake being corrected on the instant.

At the meeting of the Illinois State Medical Society, in Chicago, in May, 1884, a lad, ten years old, born with complete cleft of the palate, both hard and soft, was presented, who read in a clear voice so as to be distinctly heard at the farther end of the room, without any defect or peculiarity of speech. The operation had been made in two sittings, when five years old, the soft palate being first closed and the hard palate several months later.

This lad has not only recovered perfect speech, but he can whistle. This implies a very good closure of the palate against the posterior wall of the pharynx; otherwise, there would be too much leak of air through the nostrils.

The ability to apply the palate to the posterior wall of the pharynx is greatly aided by the careful drill of the patient.

The backward movement of the palate is effected by the palato-pharyngeus muscle. The frequent effort induces an elongation of the muscular fibres and a consequent expansion of the muscular curtain.

The patient if left to himself, if not very young, might never make this effort and never be educated into the achievement of drawing the palate far enough back to close the posterior communication with the nostrils.

In regard to the operation; in the progress of the study through several years it was found that the division of the pillars of the fauces, practiced by Fergusson,* is worse than useless. The muscular fibres of the anterior pillars approximate the two halves of the palate, as the genio-hyoglossus protrudes the tongue. The division of these muscles is recommended upon the the false theory that they pull the two halves of the palate asunder, The palato-glossus muscles really approximate the two halves.

After the removal of a strip of membrane from the inner edge of the half palate there was found, in practice, to be a tendency in the anterior muscular layer to glide upon the posterior, in the act of introducing ordinary needles.

*See note in Gray's Anatomy in connection with a description of the palate and its connections.

To prevent this occurence the needle was constructed which is shown in figure 1.

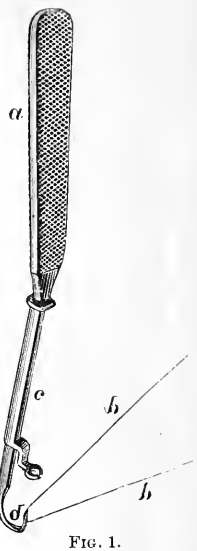


Fig. 1.

aa Shaft and handle.
bb Thread.
c Sliding shaft for compressing the two layers of the soft palate upon the point of the needle.
d Point of the needle.

In the use of this instrument the thread is picked up by a tenaculum.

Through the ingenuity of Dr. G. V. Black, an instrument has been constructed which picks up its own stitch, thus saving much time.

This needle is in two forms.

Figure 2 is the needle working direct:

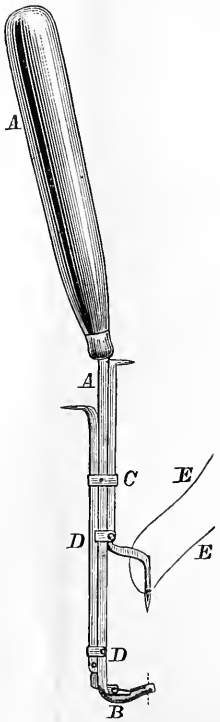


Fig. 2.

AA Shaft and handle.

B Foot piece of the shaft curved. Its extreme point has an orifice, the place of which is indicated by the dotted line. The orifice is entered by the needle C carrying the thread EE.

C Needle with thumb piece above and a point below: curved so that the point will pass the eye indicated by the dotted line.

DD Pick-up pin with a thumb piece above its sliding shaft, and its fine point above the B. As the shaft (upper D) goes down, the pin (lower D) moves horizontally and at a right angle to its shaft, and picks up the thread carried by the needle C.

EE Thread carried by the needle C, and picked up by the stiletto or pin indicated by D. This is retained while the needle is withdrawn, so that, on displacing the shaft AA, with its foot-piece B, the thread is exposed, and can be seized by a tenaculum or by the fingers.

The point of exit of the needle corresponds with that of its entrance, and the stitch is easily picked up.

It is convenient to introduce into the first thread, a second thread looped so as to be doubled. This is looped into the thread connected with the needle, and drawn into position, serving to introduce the silver wire with which the stitch is finally completed.

The instrument working laterally is illustrated in figure 3.

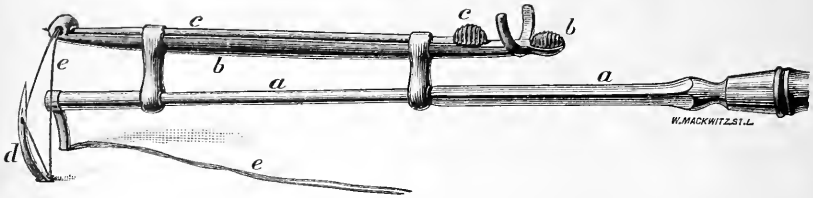


FIG. 3.

aa The main shaft of the instrument having the needle upon its distal end.

bb The movable shaft, a thumb piece at the proximal end, and an orifice at the distal end to enclose the needle in the act of picking up the thread

cc The pick-up stiletto which picks up the thread, having a thumb piece at the proximal end and a point at the distal end.

d The curved needle, represented as having pierced the tissue intended to be sutured.

ec The thread with which the needle is armed and which has been picked up by the pick-up stiletto.

The pick-up portion of the instrument is in the position in which it is about to be withdrawn toward the handle, so as to bring the thread within reach of the fingers on the outside, when the instrument is employed in the mouth or other deep place.

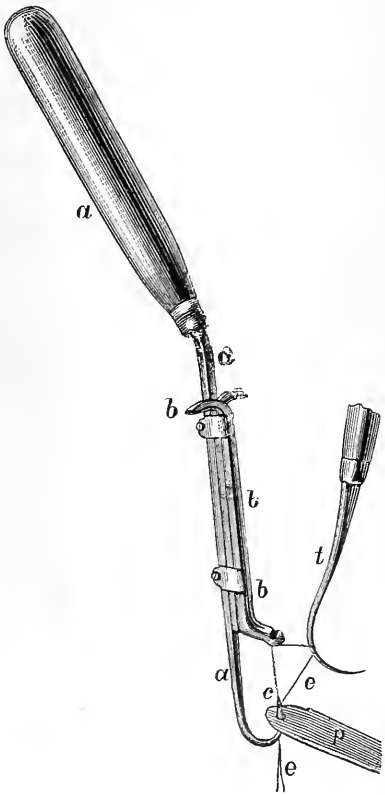


FIG. 4.

Fig. 4. Needle acting in the reverse direction—the needle, which is curved, passing behind the part to be stitched, which in the cut is represented by *p*.

a a a The shaft having the handle at one end and the needle at the other.

b b b Slide carrying the pick-up stilletto, which in the cut is seen to hold fast to the thread *c* which it is about to release.

c c c The thread which has been picked up after passing through the tissue *p* to tenaculum holding the thread as it is about to be released from the grasp of the pick-up.

By the use of these needles the time necessary for the operation is greatly diminished. This is an important consideration in an operation which is necessarily slow.

It has until now been a desideratum to protect the shallow sutures from the strain occasioned by the action of the tenosor palati muscles; and for this purpose, Dieffenbach many years ago had practiced deep vertical incisions. The dangerous hemorrhage occuring in some instances, prevented the general adoption of this expedient.

The present writer has employed the platinum wire heated by the galvanic current to secure a vertical parting of the substance without hemorrhage. This plan is found to be attended with some loss of substance, and is on that account objectionable.

Since that time, it has been found that the use of the galvano-cautery can be discontinued and the same object secured without waste of substance, by the employment of a modification of the quilled suture, a plan for which (with cut) may be found in the *Annals of Anatomy and Surgery* for March, 1883, under the name of "The Bead Suture." This suture is easy of introduction, and it performs the office of a splint—diminishing the movements of the parts of the palate, and entirely taking the strain off from the shallow stitches.

The necessity for wounding any of the deep vessels is entirely obviated, and the parts are held so firmly together that failure to unite by the first intention must be a rare exception.

The cut furnishes three illustrations of the bead suture.

1 The completed suture, the beads lying upon the natural surface of the skin or mucous membrane.

2 At the bottom is the same stitch incomplete. The bite of the forceps employed in twisting the silver wire is also seen.

3 The middle figure shows the employment of two beads on a side for greater breadth. The cut also shows a lateral incision on either side for the better approximation without tension. The beads lie in the furrow made by this incision.

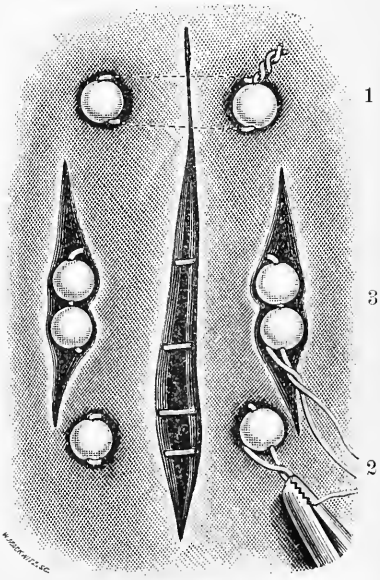


Fig. 14.

The suture admits of tightening up, if found to be too lax at any time after its introduction.

The utility of the closure of the cleft palate, both hard and soft, becomes apparent in every case. Sounds which are impossible with a permanently open communication between the mouth and the pharynx, and especially between the mouth and nose, become executed with more or less approximation to perfection.

When the cleft is closed by operation while the patient is young, the result is better than when closed later, simply because bad habits of articulation are less fixed.

It will be readily understood, that the patient with cleft palate learns to make substitutions for the true sounds by the movements of parts different from those employed in natural articulation.

When the apparatus of articulation is restored, the patient must learn anew how to use it. Unless the greatest care and caution are observed, combined with instruction in minute details, the restored organs will never attain a performance equal to their capabilities.

The same is also true where the communication is closed by vulcanite obturators. The most careful drill in both cases is necessary in order to secure the best results. When it is considered how difficult it is to correct bad habits of articulation and pronunciation where the organs are perfect, it will be readily admitted that the patient may not be a great credit to his surgeon if left to talk as he may, without having some one to point out his errors, to direct him how to correct them, and to insist, day after day, on the best use by the patient of his restored articulating apparatus.

M. Trelat relates a case of a boy with cleft palate coming from Roumania. Before leaving Paris he had learned a correct pronunciation of French words, but he still retained some of his faulty habits of pronunciation of his native language. He had his bad habits to correct, while in relation to the language which was new to him he had no habits to correct.

The early operation results in an approximation of the two sides of the face through the approximating power of the muscles acting upon the bones of the face. There are no antagonizing forces tending to spread the face and hence a small force acting all the time, produces an appreciable result. As the face is narrowed the material of the palate is relatively greater and more capable of the perfect performance of its functions and thus all objections are to some extent removed.

Besides, the skillful performance of the operation, occasions very little loss of substance.